

CLAIMS

1. In a pipette having a nozzle to which a tip may be removably mounted, a mechanism for facilitating the removal of a tip from the nozzle including:

a spring loaded ejector sleeve through which said nozzle passes, said sleeve terminating near the end of the nozzle to which a tip is mounted when the sleeve is in a normal position, the sleeve being moved away from said end of the nozzle against said spring load when the tip is mounted to said nozzle;

said sleeve including a first latch portion which mates with a second latch portion of said pipette when said sleeve is in a retracted position to which it is moved when a tip is properly mounted to said nozzle to hold said sleeve in said retracted position against said spring load, and a third latch portion operable to unmate said first and second latch portions, freeing said sleeve to return in response to said spring load to its normal position, the sleeve engaging said tip before reaching said normal position to facilitate the removal of the tip.

2. A mechanism as claimed in claim 1 including an overforce mechanism operable to supplement said spring load in moving said sleeve to said normal position against a stuck tip to further facilitate removal of said tip.

3. A mechanism as claimed in claim 1 wherein said first latch portion is a keyhole slot formed in said sleeve, wherein said second latch portion is a detent having a large portion which fits in an enlarged portion of said slot when said sleeve is in its retracted position and a small portion sized to fit in a narrow portion of said slot, said narrow portion being adjacent said detent except when the sleeve is in the retracted position, and wherein said third latch portion is a button operable for moving said small portion of the detent into said slot, whereby said sleeve becomes unlatched.

4. A mechanism as claimed in claim 3 wherein said detent is spring biased to move the large portion of the detent into said slot.

5. A mechanism as claimed in claim 1 wherein said first latch portion is a projection at a proximal end of said sleeve, said second latch portion is a mating lip on a

latch plate biased to have the lip engage the projection when the sleeve is in its retracted position, and said third latch portion is a portion of said latch plate which is manually operable to move the plate against its bias to move said lip away from said projection, permitting said sleeve to return to its normal position.

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6. A mechanism as claimed in claim 5 including an angled surface on said plate positioned to engage an angled surface associated with said sleeve when said latch plate is moved beyond the point where said lip no longer engages said projection to supplement said spring load in moving said sleeve to its normal position against a stuck tip to further facilitate removal of said tip.

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7. A mechanism as claimed in claim 1 including a mechanism for controlling the force with which a tip is mounted to said nozzle.

8. A mechanism as claimed in claim 7 wherein said mechanism for controlling includes mounting said nozzle to be movable away from a tip mounting force and against a bias spring.

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9. A mechanism as claimed in claim 8 wherein said bias spring has less load than the spring load applied to said ejector sleeve.

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10. A mechanism as claimed in claim 1 wherein said ejector sleeve is moved away from said end of the nozzle by said tip.

11. A mechanism as claimed in claim 1 wherein said tips are mounted in a rack having a protrusion adjacent each tip, and wherein said ejector sleeve is moved away from said end of the nozzle by the protrusion adjacent the tip being mounted.

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12. A mechanism as claimed in claim 1 wherein the mating of said first and second latch portions results in an operator perceptible feedback output.

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13. A mechanism as claimed in claim 12 wherein said operator perceptable feedback output is at least one of an audible output and a tactile output.

14. A mechanism for facilitating the removal of a pipette tip from a pipette nozzle including:

an ejector normally biased to a first position near an end of said nozzle to which said tip is mounted, and movable as said tip is mounted to said nozzle against the bias, the ejector reaching a retracted position when the tip is fully mounted; and

a latch for maintaining the ejector in said retracted position, said latch including a selectively operable latch release, the bias returning said ejector to said first position when said latch release is operated to facilitate ejection of the tip mounted to the nozzle.

15. A mechanism as claimed in claim 14 including an overforce mechanism operable to supplement said bias in moving said ejector to said normal position against a stuck tip to further facilitate removal of said tip.

16. A mechanism as claimed in claim 14 including a mechanism for controlling the force with which a tip is mounted to said nozzle.

17. A mechanism as claimed in claim 14 wherein there are a plurality of different tip types, each of which contacts both the ejector and the nozzle as it is mounted to the nozzle and moves each against a bias force, each tip type having a different base configuration which results in a difference in the relative displacement of the nozzle to the ejector, and a mechanism for detecting such difference in relative displacement to thus identify tip type.

18. A mechanism for facilitating the removal of a pipette tip from a pipette nozzle including a mechanism which stores mechanical energy when a tip is mounted to said nozzle, and which releases the stored mechanical energy when the tip is to be removed to facilitate removal thereof.

19. A mechanism as claimed in claim 18 wherein said mechanism for storing includes a latching mechanism operative when said mechanical energy is fully stored, an operator detectable output being generated when said latching mechanism operates.

5 20. A mechanism as claimed in claim 18 including a mechanism which limits the force with which the tip is mounted to the nozzle.

21. A mechanism as claimed in claim 18 including an overforce mechanism for further facilitating removal of a stuck tip.

10 22. In a pipette, a mechanism for detecting the type of pipette tip being mounted to a pipette nozzle including:
a sleeve mechanism surrounding said nozzle, at least one of said sleeve mechanism and said nozzle being mounted to be selectively retracted when in contact
15 with a tip as a tip is pressed on said nozzle to be mounted thereto, each tip type having a different base configuration which results in a difference in the relative displacement of the nozzle to the sleeve mechanism, and a mechanism for detecting such difference in relative displacement to thus identify tip type.

20 23. A mechanism as claimed in claim 22 wherein said sleeve has a selected stroke, and wherein said mechanism for detecting includes a sensor generating an output when the sleeve is retracted for its selected stroke and a detector for nozzle retraction, said detector output, when said sensor generates an output, being indicative of tip type.

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